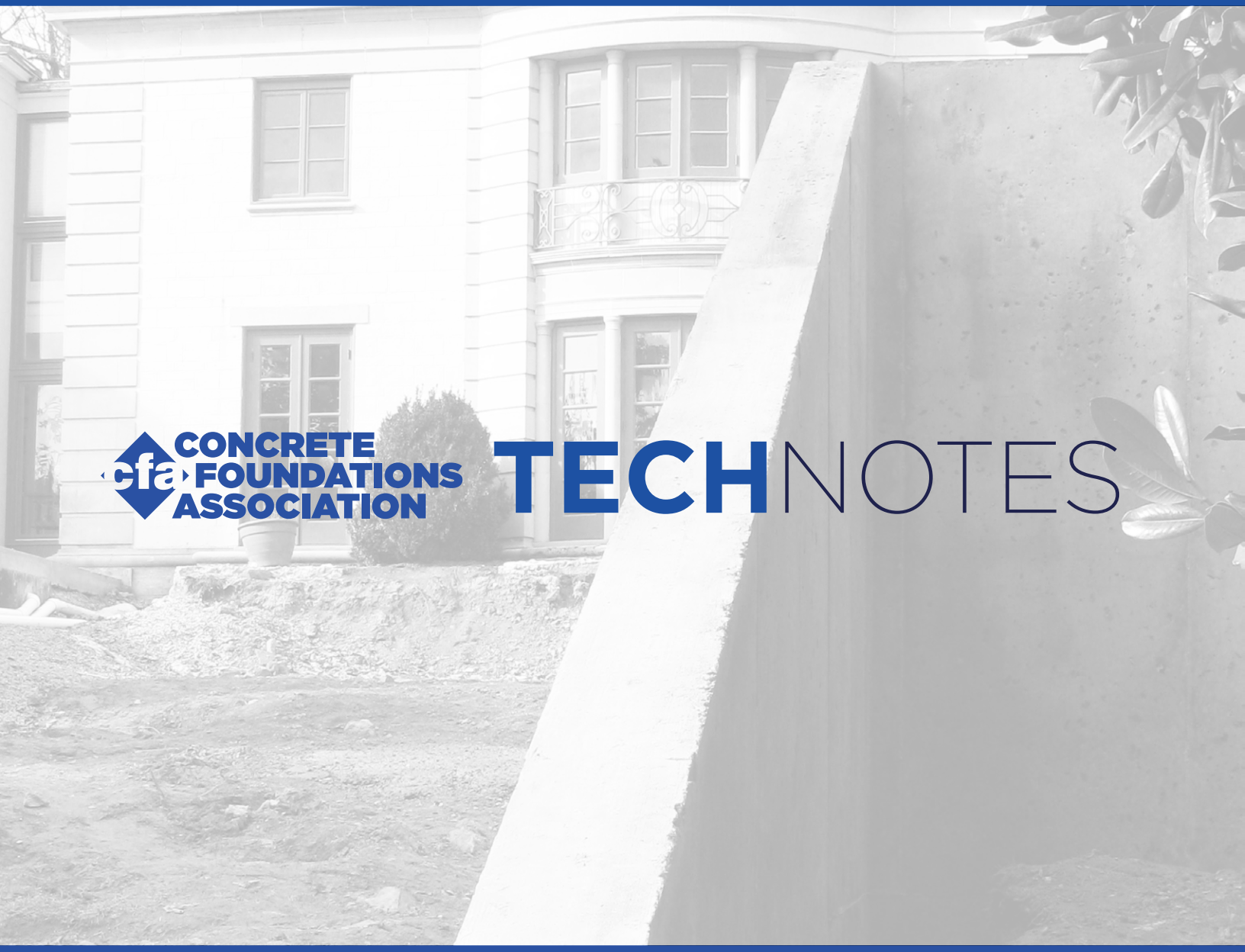

CONCRETE FOUNDATIONS ASSOCIATION

TECHNOTES

CFA-TN-014

Interpreting Nominal Concrete Wall Thickness

Interpreting Nominal Concrete Wall Thickness

Introduction

A frequent point of discussion between contractors, designers, and code authorities involves the interpretation of "nominal" versus "actual" concrete wall thickness. This technical note provides clarification on this topic by examining relevant building codes and industry standards. Understanding the code-defined relationship between nominal and actual dimensions is essential for ensuring compliance and project continuity.

Analysis of Code Requirements

The question of whether a nominal 8-in. wall thickness, which is an actual wall thickness of 7.5-in. meets the code requirement for an actual 8-in. wall can be definitively answered by reviewing the International Residential Code (IRC) and ACI 332, *Residential Code Requirements for Structural Concrete*. These documents are frequently adopted or referenced by state and local jurisdictions, such as the Wisconsin Uniform Dwelling Code (UDC).

INTERNATIONAL RESIDENTIAL CODE (IRC)

The IRC provides a clear definition for the allowable tolerance of nominal wall thickness. **Section R404.1.3.1** directs users to **Table R608.3** for concrete cross-sectional dimensions. Sub-note "c" within this table states:

Nominal wall thickness. *The actual as-built thickness of a flat wall shall not be more than ½ inch less or more than ¼ inch more than the nominal dimension indicated.*

Based on this definition, a wall with a nominal thickness of 8 inches is permitted to have an actual as-built thickness of not less than 7 ½ inches. It is common in the residential foundation industry for form tie lengths used in formed walls to result in an actual thickness of 7 ⅝ inches, and therefore is fully compliant with this IRC provision. Additionally, many foundation wall forms have a brick stamp texture that results in variability to the actual wall thickness depending on the specific cross section measured.

TABLE R608.3
DIMENSIONAL REQUIREMENTS FOR WALLS[a]

WALL TYPE AND NOMINAL THICKNESS	MAXIMUM WALL WEIGHT[b] (psf)	MINIMUM WIDTH, W, OF VERTICAL CORES (inches)	MINIMUM THICKNESS, T, OF VERTICAL CORES (inches)	MAXIMUM SPACING OF VERTICAL CORES (inches)	MAXIMUM SPACING OF HORIZONTAL CORES (inches)	MINIMUM WEB THICKNESS (inches)
4" Flat[c]	50	NA	NA	NA	NA	NA
6" Flatc	75	NA	NA	NA	NA	NA
8" Flat[c]	100	NA	NA	NA	NA	NA
10" Flat[c]	125	NA	NA	NA	NA	NA
6" Waffle-grid	56	8[d]	5.5[d]	12	16	2
8" Waffle-grid	76	8[e]	8[e]	12	16	2
6" Screen-grid	53	6.25[f]	6.25[f]	12	12	NA

For SI: 1 inch = 25.4 mm; 1 pound per square foot = 0.0479 kPa, 1 pound per cubic foot = 2402.77 kg/m^3, 1 square inch = 645.16 mm^2, 1 inch^4 = 42 cm^4.

NA = Not Applicable.

a. Width "W," thickness "T," spacing and web thickness, refer to Figures R608.3(2) and R608.3(3).

b. Wall weight is based on a unit weight of concrete of 150 pcf. For flat walls the weight is based on the nominal thickness. The tabulated values do not include any allowance for interior and exterior finishes.

c. Nominal wall thickness. The actual as-built thickness of a flat wall shall not be more than ½ inch less or more than ¼ inch more than the nominal dimension indicated.

d. Vertical core is assumed to be elliptical-shaped. Another shape of core is permitted provided the minimum thickness is 5 inches, the moment of inertia, *I*, about the centerline of the wall (ignoring the web) is not less than 65 inch^4 , and the area, *A*, is not less than 31.25 square inches. The width used to calculate *A* and *I* shall not exceed 8 inches.

e. Vertical core is assumed to be circular. Another shape of core is permitted provided the minimum thickness is 7 inches, the moment of inertia, *I*, about the centerline of the wall (ignoring the web) is not less than 200 inch^4 , and the area, *A*, is not less than 49 square inches. The width used to calculate *A* and *I* shall not exceed 8 inches.

f. Vertical core is assumed to be circular. Another shape of core is permitted provided the minimum thickness is 5.5 inches, the moment of inertia, *I*, about the centerline of the wall is not less than 76 inch^4, and the area, *A*, is not less than 30.25 square inches. The width used to calculate *A* and *I* shall not exceed 6.25 inches.

TABLE R404.1.2(8)
MINIMUM VERTICAL REINFORCEMENT FOR 6-, 8-, 10, AND 12-INCH NOMINAL FLAT BASEMENT WALLS [b, c, d, e, f, h, i, k, n, o]

MAXIMUM WALL HEIGHT (feet)	MAXIMUM UNBALANCED BACKFILL HEIGHT[g] (feet)	MINIMUM VERTICAL REINFORCEMENT-BAR SIZE AND SPACING (inches)											
		Soil classes[a] and design lateral soil (psf per foot of depth)											
		GW, GP, SW, SP 30				GM, GC, SM, SM-SC AND ML 45				SC, ML-CL inorganic CL 60			
		Minimal nominal wall thickness (inches)											
		6	8	10	12	6	8	10	12	6	8	10	12
7	4	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	5	NR	NR	NR	NR	NR	NR	NR	NR	5 @ 47	NR	NR	NR
	6	NR	NR	NR	NR	5 @ 42	NR	NR	NR	6 @ 43	5 @ 48	NR[1]	NR
	7	5 @ 46	NR	NR	NR	6 @ 42	5 @ 46	NR[1]	NR	6 @ 34	6 @ 48	NR	NR
8	4	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	5	NR	NR	NR	NR	4 @ 38	NR[1]	NR	NR	5 @ 43	NR	NR	NR
	6	4 @ 37	NR[1]	NR	NR	5 @ 37	NR	NR	NR	6 @ 37	5 @ 43	NR[1]	NR
	7	5 @ 40	NR	NR	NR	6 @ 37	5 @ 41	NR[i]	NR	6 @ 34	6 @ 43	NR	NR
	8	6 @ 43	5 @ 47	NR[1]	NR	6 @ 34	6 @ 43	NR	NR	6 @ 32	6 @ 44	6 @ 44	NR

A portion of Table R404.1.2(8) from the 2015 International Residential Code, p. 113.

IRC WALL REINFORCEMENT TABLES

Above is a portion of **Table R404.1.2(8)** from the current International Residential Code, one of seven tables in chapter 4 for foundations pertaining to concrete walls and reinforcement requirements. Four of these tables address the construction of flat concrete walls, built with either insulated concrete forms (ICFs) or removable concrete forms. These tables all use the term "nominal" in the title and provide footnotes that reference the acceptable dimensional tolerance as identified in **Table R608.3**. This table demonstrates the approach to wall construction using a variety of wall thickness and reinforcement pattern solutions. The sub-note "i" from this table states: *See **Table R608.3** for tolerance from nominal thickness permitted for flat walls.*

The preceding wall tables in **R404.1.1** all address the minimum standards for concrete masonry unit (cmu) foundation walls of nominal thickness, referencing whole dimensions from 6 to 12 inches. Industry standard for masonry and wood dimensions have a long history of using nominal reference to infer actual dimensions. This approach is consistent across building standards as well, where so many different forming systems, many with patterns resulting in further variability of the wall cross section thickness, are designed specifically to interact with or accommodate the experience and expectations of this nominal vs. actual relationship to masonry and wood.

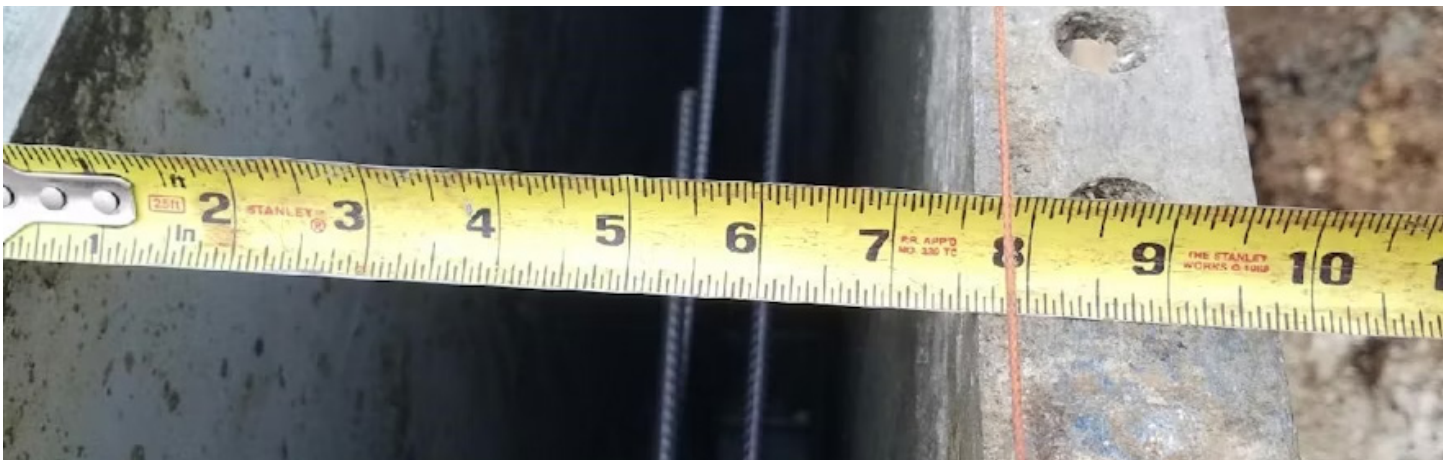

Fig. 1: Concrete wall forms set for residential foundation showing a nominal 8-in. wall thickness with an actual thickness set at 7 5/8-in. *Concrete Foundations Assoc.*

TABLE 9.5.3.1b
VERTICAL REINFORCING BAR SPACING FOR CONCRETE BASEMENT WALLS; f'_c = 2500 psi and f_y = 60,000 psi

REINFORCING BAR SPACING FOR SOLID CONCRETE FOUNDATION WALLS																								
Maximum clear wall height, ft	f'_c (psi) = 2500		Maximum equivalent fluid pressure of soil, psi/ft																					
	f'_c (psi) = 60,000		30						45						60						100			
	Unbalanced Backfill, ft	Reinforcing Bar	Wall thickness, in.						Wall thickness, in.						Wall thickness, in.						Wall thickness, in.			
			8		10		12		8		10		12		8		10		12		8		10		12	
			I	C	I	C	I	C	I	C	I	C	I	C	I	C	I	C	I	C	I	C	I	C	I	C
8	5	#4 @ … in.	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC
		#5 @ … in.	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC
		#6 @ … in.	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC
	6	#4 @ … in.	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	**24**	**13**	PC	PC	PC	PC
		#5 @ … in.	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	**37**	**21**	PC	PC	PC	PC
		#6 @ … in.	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	**48**	**29**	PC	PC	PC	PC
	7	#4 @ … in.	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	**29**	**16**	PC	PC	PC	PC	**17**	**9**	**22**	**12**	PC	PC
		#5 @ … in.	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	**44**	**25**	PC	PC	PC	PC	**26**	**14**	**35**	**19**	PC	PC
		#6 @ … in.	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	**48**	**35**	PC	PC	PC	PC	**37**	**20**	**48**	**27**	PC	PC

ACI 332: RESIDENTIAL CODE REQUIREMENTS FOR STRUCTURAL CONCRETE

ACI 332 is established as an accepted alternative in the IRC and is often referenced or chosen directly by state codes, like the Wisconsin UDC. It offers more detailed prescriptive requirements for residential concrete walls. The standard provides tables for plain and reinforced concrete walls based on specific, actual minimum thicknesses.

- **ACI 332-20, Section 9.3.1.2** establishes that the minimum uniform wall thickness shall be 7.5 inches.
- **ACI 332-20, Tables 9.5.3.1 (a) thru (j)** are prescriptive tables based on a "Specified minimum actual wall thickness" of 7.5 in., 9.5 in., and 11.5 in. but refer to them in the table as 8 in., 10 in. and 12 in.

The ACI 332 standard directly validates the structural adequacy of a 7.5-inch actual wall thickness for applications where a nominal 8-inch wall is specified. The performance values and prescriptive tables within ACI 332 are engineered with this minimum actual thickness in mind, confirming that a 7 5/8-in. wall performs as intended under the specified design conditions.

The UDC permits a "nominal" wall thickness and, by referencing ACI 332, implicitly accepts the engineering basis for a minimum 7.5-inch actual thickness. The inspector's concern that a 7 5/8-in. wall does not meet the structural requirements of an 8-in. wall is addressed by the fact that the IRC and ACI 332 have already accounted for this tolerance in their prescriptive designs.

Conclusion and Recommendations

The building codes provide clear evidence supporting the use of an industry standard actual wall thickness of up to ½-in. less where a nominal wall thickness is specified.

- The IRC explicitly allows for an as-built thickness of up to ½ inch less than the nominal dimension. A 7 5/8-in. wall is well within this tolerance for a nominal 8-in. wall.
- ACI 332 establishes its prescriptive tables for foundation walls on a minimum actual thickness of 7.5 inches, confirming the structural validity of this dimension.
- Contractors facing challenges from code officials on this matter should be prepared to reference these specific sections of the IRC and ACI 332 to substantiate their construction methods.

A thorough understanding of these code provisions can help facilitate productive conversations with inspectors, prevent project delays, and ensure that foundation walls are accepted as compliant with established industry standards. When local codes appear simplified or ambiguous, referencing the foundational model codes (IRC) and referenced standards (ACI 332) provides the necessary clarification. ■

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ABOUT THE CFA
The Concrete Foundations Association (CFA) was formed in 1975 to serve the interests of poured wall contractors. As an international nonprofit trade association with a diverse membership spread throughout the United States and Canada, maintains a network that permits individuals with needs and interests to seek advice and professional experience while curating forums where contractors exchange ideas and gain insight for technological and practice advancements.